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Byron Station  
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October 17, 2004

LTR: BYRON 2004-0111  
File: 2.01.0700

United States Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Washington, DC 20555-0001

Subject: Licensee Event Report (LER) 454-2004-001-00, "Reactor Containment Fan  
Coolers Flow Rates Below Technical Specification Requirements Due to  
Inaccurate Flow Indication"

Byron Station, Unit 1  
Facility Operating License No. NPF-37  
NRC Docket No. STN 50-454

Enclosed is an LER involving the August 17, 2004, event involving low flow conditions discovered in Unit 1 Reactor Containment Fan Coolers for a time period longer than allowed by the Technical Specifications. This event is reportable to the NRC in accordance with 10CFR 50.73 (a)(2)(i)(B), as a condition prohibited by Technical Specifications.

Should you have any questions concerning this matter, please contact Mr. William Grundmann, Regulatory Assurance Manager, at (815) 234-5441, extension 2800.

Respectfully,

*Stephen Kuczynski*

Stephen E. Kuczynski  
Site Vice President  
Byron Nuclear Generating Station

Attachment LER 454-2004-001-00

cc: Regional Administrator, Region III, NRC  
NRC Senior Resident Inspector- Byron Station

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## LICENSEE EVENT REPORT (LER)

Estimated burden per response to comply with this mandatory information collection request: 50 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records Management Branch (T-6 E6), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by Internet e-mail to bjs1@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202 (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

1 FACILITY NAME

Byron Station, Unit 1

2 DOCKET NUMBER

0500454

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## 4. Reactor Containment Fan Coolers Flow Rates Below Technical Specifications Requirements Due to Inaccurate Flow Indication

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MO	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
08	17	2004	2004	001	00	10	18	2004	FACILITY NAME	DOCKET NUMBER
9. OPERATING MODE		1	11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)							
10. POWER LEVEL		100	20.2201(b)			20.2203(a)(3)(ii)			50.73(a)(2)(ii)(B)	50.73(a)(2)(ix)(A)
			20.2201(d)			20.2203(a)(4)			50.73(a)(2)(iii)	50.73(a)(2)(x)
			20.2203(a)(1)			50.36(c)(1)(i)(A)			50.73(a)(2)(iv)(A)	73.71(a)(4)
			20.2203(a)(2)(i)			50.36(c)(1)(ii)(A)			50.73(a)(2)(v)(A)	73.71(a)(5)
			20.2203(a)(2)(ii)			50.36(c)(2)			50.73(a)(2)(v)(B)	OTHER
			20.2203(a)(2)(iii)			50.46(a)(3)(ii)			50.73(a)(2)(v)(C)	Specify in Abstract below or in NRC Form 366A
			20.2203(a)(2)(iv)			50.73(a)(2)(i)(A)			50.73(a)(2)(v)(D)	
			20.2203(a)(2)(v)		X	50.73(a)(2)(i)(B)			50.73(a)(2)(vii)	
			20.2203(a)(2)(vi)			50.73(a)(2)(i)(C)			50.73(a)(2)(viii)(A)	
			20.2203(a)(3)(i)			50.73(a)(2)(ii)(A)			50.73(a)(2)(viii)(B)	

## 12. LICENSEE CONTACT FOR THIS LER

NAME William Grundmann, Regulatory Assurance Manager	TELEPHONE NUMBER (Include Area Code) (815) 406-2800
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## 13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
X	BI	FI	Dieterich Standard	TBD					

## 14. SUPPLEMENTAL REPORT EXPECTED

X	YES (If yes, complete EXPECTED SUBMISSION DATE)	NO	15. EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR
				04	15	2005

16. ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)

On August 17, 2004, it was recognized that the Essential Service Water (SX) flow rates to the 1A, 1B, and 1C Reactor Containment Fan Coolers (RCFCs) were below the Technical Specification (TS) minimum value. The appropriate Technical Specification Action condition was entered. It was determined the flow rates were inadvertently throttled below the limit on April 20, 2004 due to inaccurate flow indicators used to re-adjust flow rates. The flow instruments are annubar flow measurement devices. On August 19, 2004, flow rates were readjusted using ultrasonic flow instrumentation and TS action condition exited. The root cause of the installed inaccurate flow indicators is currently indeterminate. A troubleshooting plan will be implemented in next refuel outage to determine the cause of the inaccurate flow indication. The findings and corrective actions to prevent recurrence will be reported in a supplement to this report. Interim corrective actions include an adverse monitoring plan to ensure flow rates to the RCFCs remain above the minimum flow and enhancing the SX system monitoring plan for better detection of adverse trends. An engineering evaluation is in progress assessing the safety significance of the low flow condition to the Unit 1 1A, 1B, and 1C RCFCs for the 119 day period. The results of the evaluation will also be reported in a supplement to this report. This is reportable to the NRC in accordance with 10 CFR 50.73(a)(2)(i)(B) as a condition prohibited by Technical Specifications.

**LICENSEE EVENT REPORT (LER)**  
TEXT CONTINUATION

Estimated burden per response to comply with this mandatory information collection request: 50 hrs. Reported lessons learned are incorporated into the licensing process and fed back to industry. Forward comments regarding burden estimate to the Information and Records Management Branch (t-6 f33), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, and to the Paperwork Reduction Project (3150-0104), Office Of Management And Budget, Washington, DC 20503. If an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

FACILITY NAME (1)		DOCKET NUMBER (2)		LER NUMBER (6)			PAGE (3)
Byron Station, Unit 1		STN 0500454		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
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(If more space is required, use additional copies of NRC Form 366A)(17)

**A. Plant Conditions Prior to Event:**

Event Date/Time: August 17, 2004 / 0855 hours

Unit 1 - Mode 1 - Power Operations, Reactor Power 100%

Reactor Coolant System [AB]: Normal operating temperature and pressure.

No structures, systems or components were inoperable at the start of the event that contributed to the event.

**Background**

Byron Station Unit 1 has two trains of containment cooling each of sufficient capacity to supply 100% of the design basis containment cooling requirement. Each train consists of two Reactor Containment Fan Coolers (RCFCs) [IK]. The RCFCs are supplied cooling water from the Essential Service Water System (SX) [BI], which is throttled to each cooler to keep the SX flow rate above the minimum Technical Specification (TS) required flow rate of 2260 gpm.

**B. Description of Event:**

During performance of a 1A SX pump surveillance on August 17, 2004, the SX System Engineer (non-licensed) observed an unexpectedly low flow rate in the 1A train SX supply header. The flow rate of 4560 gpm was measured using an ultrasonic flow meter where as a nominal flow of greater than 5320 gpm would be expected. This supply header provides flow to various 1A SX train components; including the two RCFCs of the A train of containment cooling (i.e., the 1A and 1C RCFCs). Realizing that the Technical Specifications require a minimum SX flow rate of 2660 gpm for each of the two RCFCs, the SX System Engineer recognized that the observed 1A SX header flow rate could not support the required minimum flow to the two RCFCs. The U1 Operations Shift Supervisor (licensed) was immediately notified. The 1A SX supply header flow rate was re-checked using different ultra-sonic flow instrumentation and the same low flow condition was confirmed. At this time the 1A and 1C RCFC were declared inoperable and TS Limiting Condition for Operation (LCO) 3.6.6, "Two containment Spray trains and two containment cooling trains shall be operable," Action C was entered for one train of containment cooling inoperable. The entry time was retroactive to the first shift notification by the SX System Engineer.

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A troubleshooting plan was immediately developed to resolve this discrepancy. The local installed flow indicators inside containment, which are used to throttle flow to the RCFCs, were checked and all indicated a flow rate of greater than 2660 gpm to each RCFC. These instruments are Annubar flow measuring devices. These flow rates were then checked to all four RCFCs using an ultrasonic flow instrumentation. Flow to the 1A, 1C and 1B RCFCs were found to be below the TS minimum value of 2660 gpm. Since TS 3.6.6 LCO, Action C, also covers two trains of containment cooling inoperable, additional TS actions were not necessary. It was apparent at this time the installed flow rate indicators to the RCFCs were reading inaccurately.

Historical surveillance data were reviewed of the 1A Supply header flow rates from the quarterly 1A SX and 1B SX pump surveillances and the monthly RCFC flow rates verification. The RCFC flow rates were consistent with the 1A SX header flow and above the TS limit until the April 20, 2004 RCFC flow verification surveillance. In this surveillance, the flow to the 1D RCFC was found to be below 2660 gpm. In order to adjust flow of one RCFC it is necessary adjust and re-balance flow to the other three RCFCs. The throttle valves were repositioned to achieve a flow rate of greater than 2660 gpm on each RCFC based on the installed flow instrumentation. At this time it is believed that the flow rates were inadvertently adjusted below the TS minimum flow for the 1A, 1B, and 1C RCFCs due to the installed flow rate indicators reading inaccurately.

On August 19, 2004, the flow rates to all four RCFCs were adjusted to greater than 2660 gpm using the ultrasonic flow instrumentation. In addition, a successful thermal performance test on the Unit 1A RCFC was completed on August 19, 2004.

The 1A, 1B, and 1C RCFCs had SX flow rates below the TS value of 2660 gpm from April 20, 2004 until August 18, 2004 (i.e., 119 days). This is a period longer than the allowed 7 days by Technical Specifications. Consequently, this is a reportable to the NRC in accordance with 10 CFR 50.73(a)(2)(i)(B) as a condition prohibited by Technical Specifications.

C. Cause of Event:

The cause for this event was inaccurate indication of SX flow rate through the RCFC's. The root cause of the inaccurate indication is currently indeterminate. The installed Annubar flow measurement device is a multiple tubed probe that has holes on both the upstream and downstream sides to measure differential pressure.

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Failure mechanisms for the Annubar device are: plugging or fouling of the probe holes, air entrainment inside the probe or instrument sensing lines, failure of the weld that divides the high pressure side from the low pressure side, failure of the flow indicator and flow anomalies due to improper design implementation. Further actions will attempt to determine the actual cause of the failure.

Three potential contributing causes were identified:

Failure to fully review lesson learned documents from similar issues at Braidwood Station involving their RCFCs flow measurement devices.

The SX supply header flow was not identified as a parameter that could be trended in the system monitoring plan to identify degraded flow conditions in the RCFC's.

Lack of guidance in monthly RCFC flow verification surveillance procedure to document as-left throttle valve positions resulted in a missed opportunity to identify the instrumentation problem.

**D. Safety Analysis:**

Two containment cooling trains, in addition to two containment spray trains, provide containment atmosphere cooling to limit post accident pressure and temperature in containment to less than design values.

An engineering evaluation is in progress assessing the safety significance of the low flow condition to the 1A, 1B, and 1C RCFCs for the 119 day period. Preliminary results indicate that both trains of containment cooling could have performed their design function with the as-found low flow condition. The final results of the evaluation will be reported in a supplement to this report due April 15, 2005.

**E. Corrective Actions:**

A troubleshooting plan will be implemented during the Unit 1 Spring 2005 refuel outage to determine the cause of the inaccurate flow rate indications. The results of the troubleshooting plan and additional corrective actions based on the findings will be reported in a supplement to this report.

Pending the identification of a corrective action to prevent recurrence, an Adverse Condition Monitoring and Contingency Plan was developed to measure the Unit 1 individual RCFC flow with ultrasonic flow instrumentation during the monthly surveillance and to monitor the total containment cooling trains RCFC flow on a weekly basis for one month.

<b>NRC FORM 366A</b> (7-2001)		<b>U.S. NUCLEAR REGULATORY COMMISSION</b>		<b>APPROVED BY OMB NO. 3150-0104</b> <b>EXPIRES 07/31/2004</b>	
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The Unit 2 RCFC SX flow indicators were verified to be reading accurately using ultrasonic flow instrumentation and will continue to be verified with ultrasonic flow instrumentation until the root cause is determined.

The interim adverse condition monitoring plan will ensure proper flow rates to the RCFC's pending the following permanent procedure changes and root cause determination:

The monthly RCFC flow surveillance will be revised to record throttle valve as found and as left valve positions and to require notification of the system engineer when re-throttling is necessary.

The quarterly SX ASME surveillance will be revised to provide criteria for the minimum allowed train SX flow rate value.

The system monitoring plan for the SX system will be revised to monitor and trend SX supply header flow data recorded during the quarterly ASME surveillances.

F. Previous Occurrences:

None

G. Component Failure Data:

Manufacturer

Dieterich Standard Corp.

Nomenclature

Annubar Flow Measuring Device

Model

FTM-75